```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to er

```
Saving House Price India.csv to House Price India.csv
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
import io
df = pd.read_csv(io.BytesIO(uploaded['House Price India.csv']))
```

```
df.head()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...	Built Year	Renovation Year
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	1921	0
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	1909	0
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	...	1939	0
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	...	2001	0
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	...	1929	0

5 rows × 23 columns

```
df.tail()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...	Built Year	Renovation Year
14615	6762830250	42734	2	1.5	1556	20000	1.0	0	0	4	...	1957	0
14616	6762830339	42734	3	2.0	1680	7000	1.5	0	0	4	...	1968	0
14617	6762830618	42734	2	1.0	1070	6120	1.0	0	0	3	...	1962	0
14618	6762830709	42734	4	1.0	1030	6621	1.0	0	0	4	...	1955	0
14619	6762831463	42734	3	1.0	900	4770	1.0	0	0	3	...	1969	2009

5 rows × 23 columns

```
df
```

```
df.columns
```

```
Index(['id', 'Date', 'number of bedrooms', 'number of bathrooms',
       'living area', 'lot area', 'number of floors', 'waterfront present',
       'number of views', 'condition of the house', 'grade of the house',
       'Area of the house(excluding basement)', 'Area of the basement',
       'Built Year', 'Renovation Year', 'Postal Code', 'Lattitude',
       'Longitude', 'living_area_renov', 'lot_area_renov',
       'Number of schools nearby', 'Distance from the airport', 'Price'],
      dtype='object')
```

```
4   6762812919  42491   3   2.00   2710   4500   1.5   0   0   4 ...  1929   0
```

```
df.dtypes
```

```
id                                         int64
Date                                       int64
number of bedrooms                         int64
number of bathrooms                      float64
living area                                int64
lot area                                   int64
number of floors                         float64
waterfront present                         int64
number of views                            int64
condition of the house                     int64
grade of the house                         int64
Area of the house(excluding basement)      int64
Area of the basement                       int64
Built Year                                 int64
Renovation Year                            int64
Postal Code                                int64
Lattitude                                float64
Longitude                                float64
living_area_renov                          int64
lot_area_renov                             int64
Number of schools nearby                   int64
Distance from the airport                  int64
Price                                      int64
dtype: object
```

```
df.info()
```

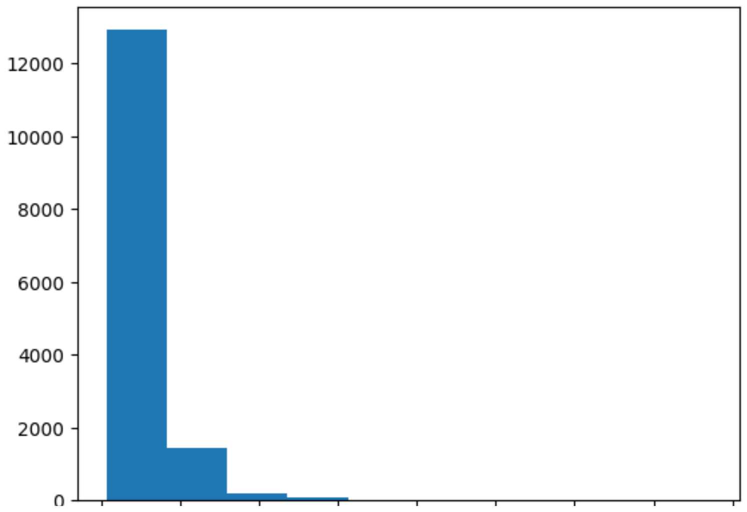
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 14620 entries, 0 to 14619
Data columns (total 23 columns):
 #   Column                                 Non-Null Count  Dtype
---  ------                                 --------------  -----
 0   id                                     14620 non-null  int64
 1   Date                                   14620 non-null  int64
 2   number of bedrooms                     14620 non-null  int64
 3   number of bathrooms                    14620 non-null  float64
 4   living area                            14620 non-null  int64
 5   lot area                               14620 non-null  int64
 6   number of floors                       14620 non-null  float64
 7   waterfront present                     14620 non-null  int64
 8   number of views                        14620 non-null  int64
 9   condition of the house                 14620 non-null  int64
 10  grade of the house                     14620 non-null  int64
 11  Area of the house(excluding basement)  14620 non-null  int64
 12  Area of the basement                   14620 non-null  int64
 13  Built Year                             14620 non-null  int64
 14  Renovation Year                        14620 non-null  int64
 15  Postal Code                            14620 non-null  int64
 16  Lattitude                              14620 non-null  float64
 17  Longitude                              14620 non-null  float64
 18  living_area_renov                      14620 non-null  int64
 19  lot_area_renov                         14620 non-null  int64
 20  Number of schools nearby               14620 non-null  int64
 21  Distance from the airport              14620 non-null  int64
 22  Price                                  14620 non-null  int64
dtypes: float64(4), int64(19)
memory usage: 2.6 MB
```

```
df.shape
```

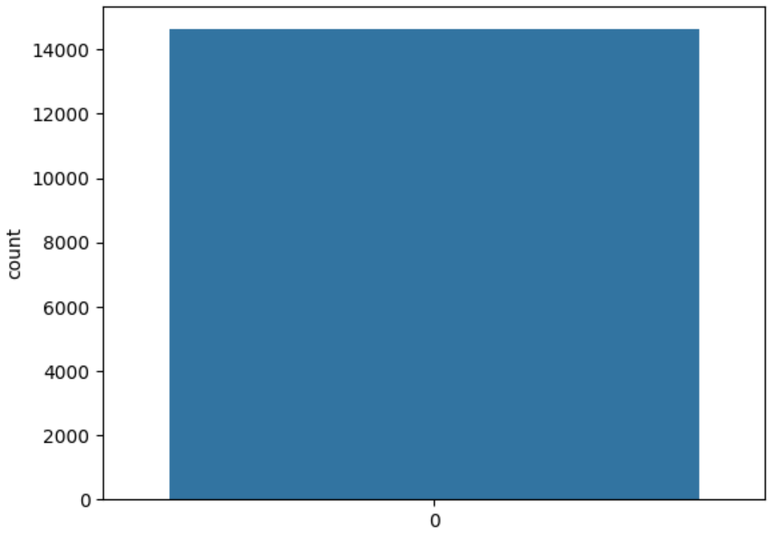
```
(14620, 23)
```

Univariate Analysis

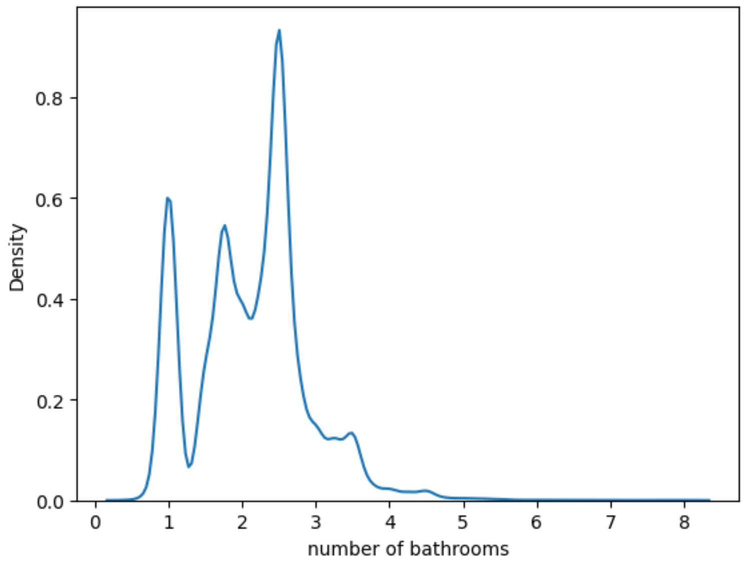
```
plt.hist(df['Price'])
plt.show()
```



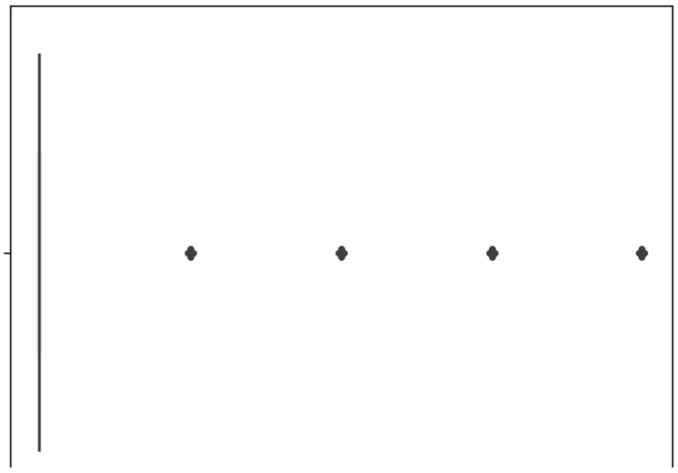
```
sns.countplot(df['number of floors'])
plt.show()
```



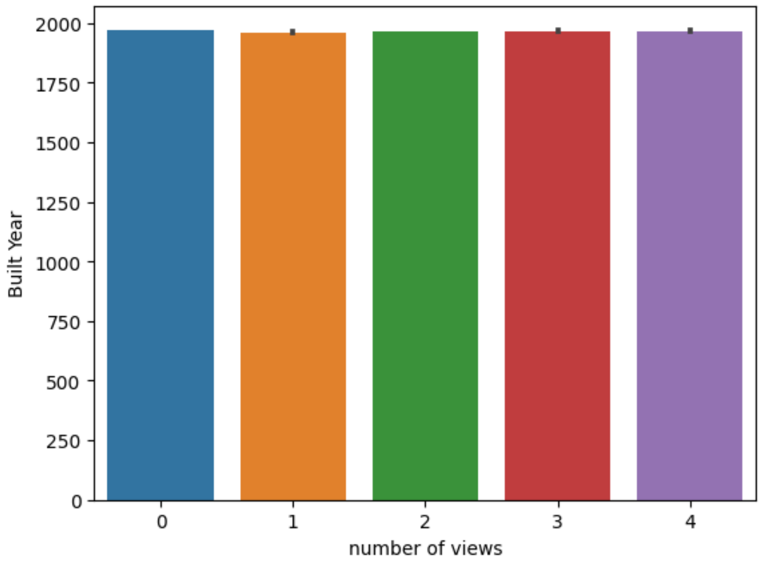
```
sns.kdeplot(df['number of bathrooms'])
plt.show()
```



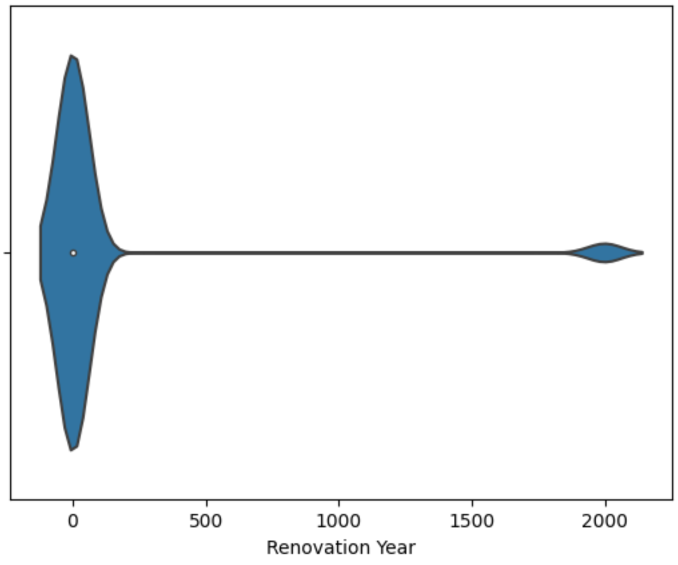
```
sns.boxplot(x=df['number of views'])
plt.show()
```



```
sns.barplot(x="number of views", y="Built Year", data=df)
plt.show()
```

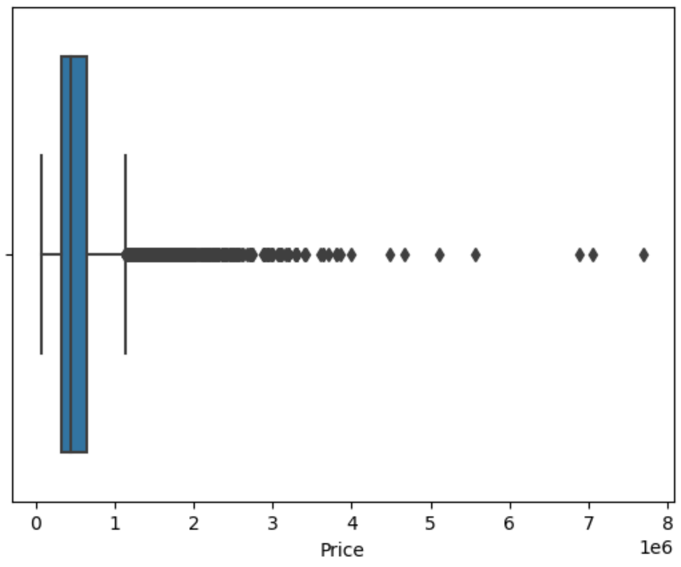


```
sns.violinplot(data=df, x="Renovation Year")
plt.show()
```

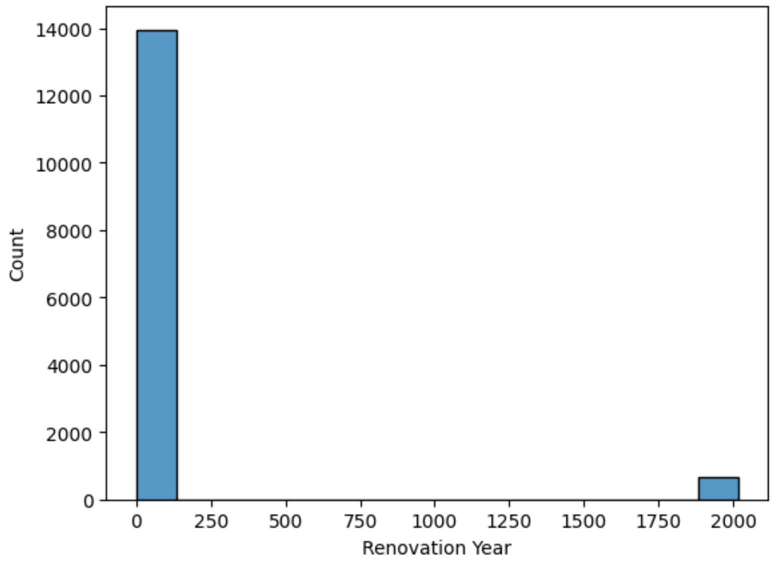


```
sns.rugplot(df['grade of the house'])
plt.show()
```

```
sns.boxplot(x=df['Price'])
plt.show()
```

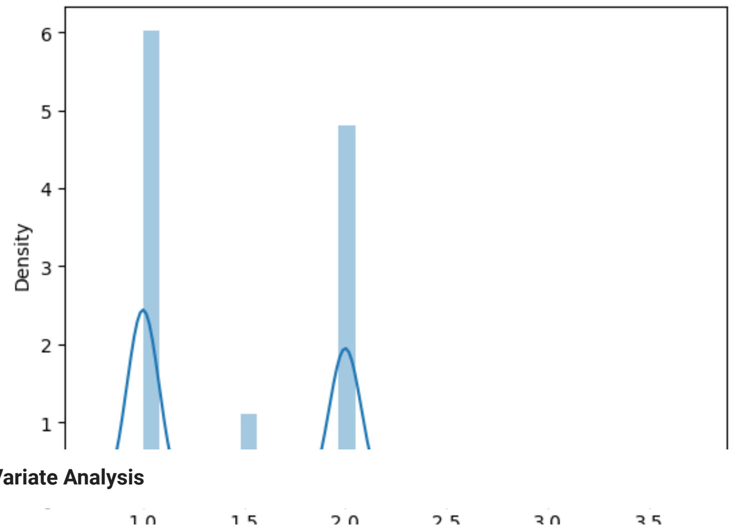


```
sns.histplot(df["Renovation Year"])
plt.show()
```



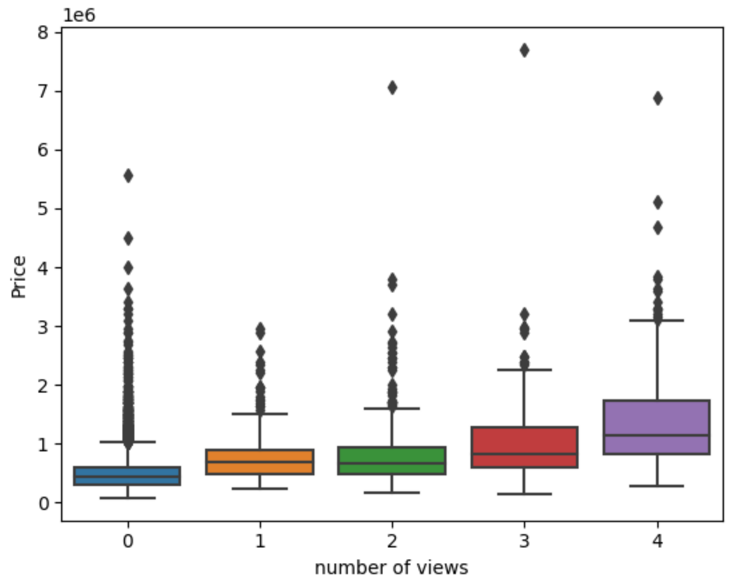
```
sns.distplot(df['number of floors'])
plt.show()
```

```
<ipython-input-26-80ba30bab10b>:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df['number of floors'])
```

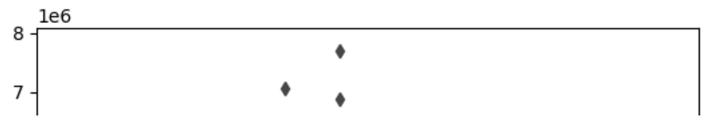


Bi - Variate Analysis

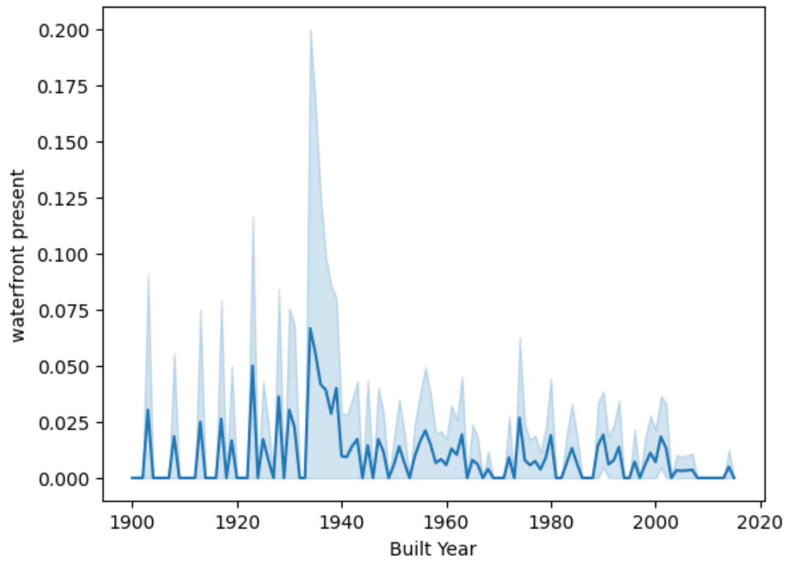
```
sns.boxplot(x=df['number of views'],y=df['Price'])
plt.show()
```



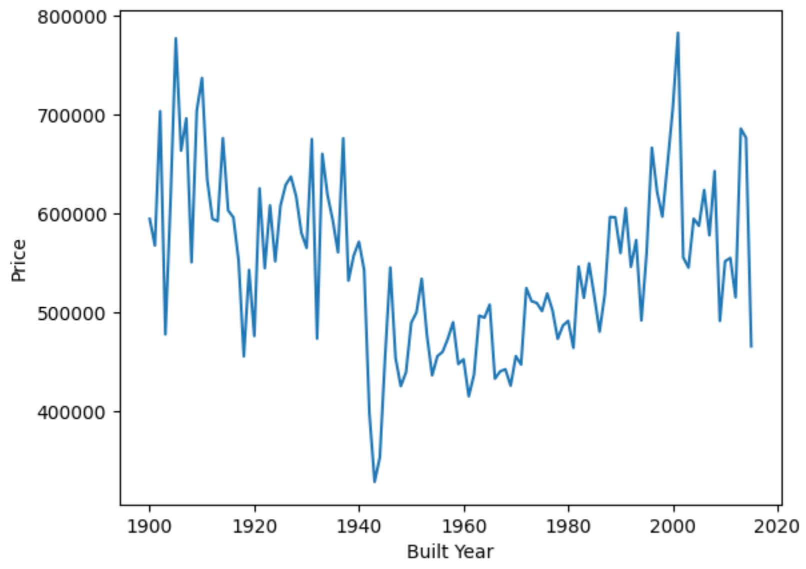
```
sns.boxplot(x=df['number of bedrooms'],y=df['Price'])
plt.show()
```



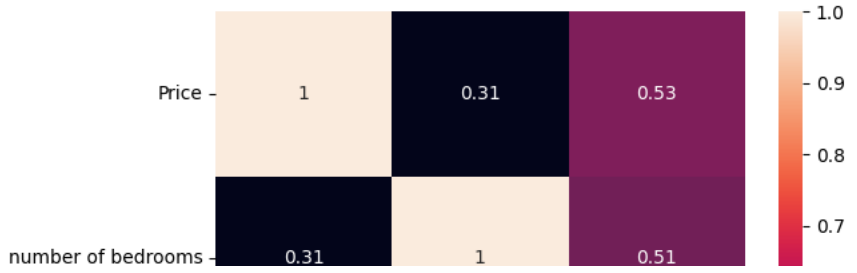
```
sns.lineplot(x=df['Built Year'],y=df['waterfront present'])
plt.show()
```



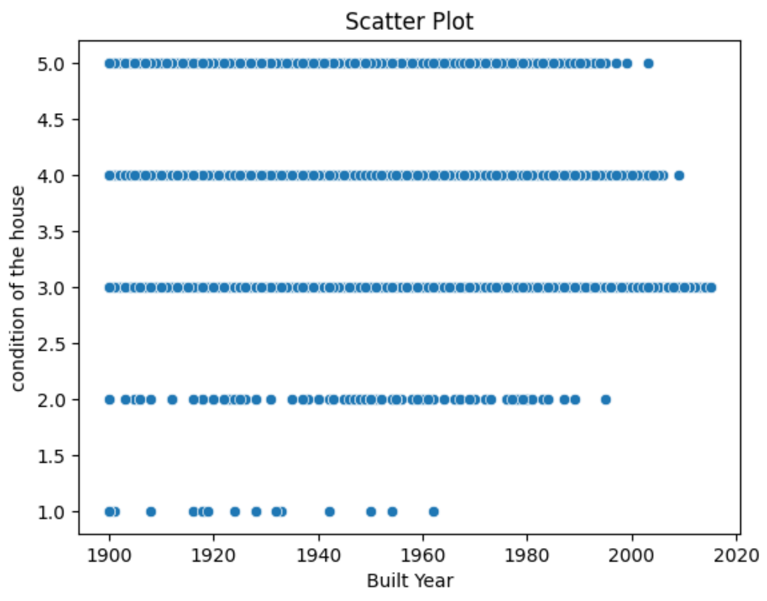
```
sns.lineplot(x=df.groupby('Built Year').mean().index, y=df.groupby('Built Year').mean()['Price'])
plt.show()
```



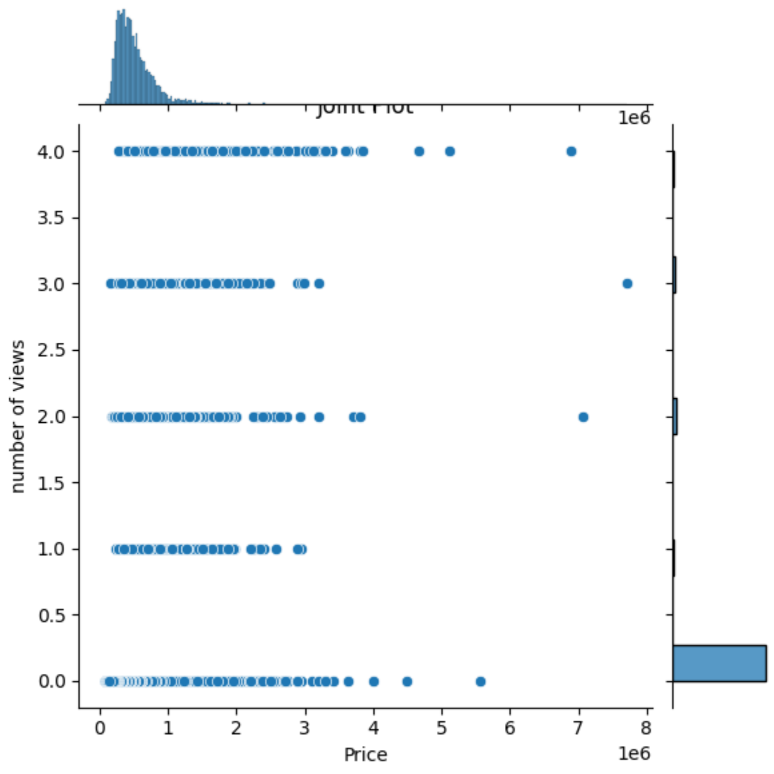
```
sns.heatmap(df[['Price', 'number of bedrooms', 'number of bathrooms']].corr(), annot=True)
plt.show()
```



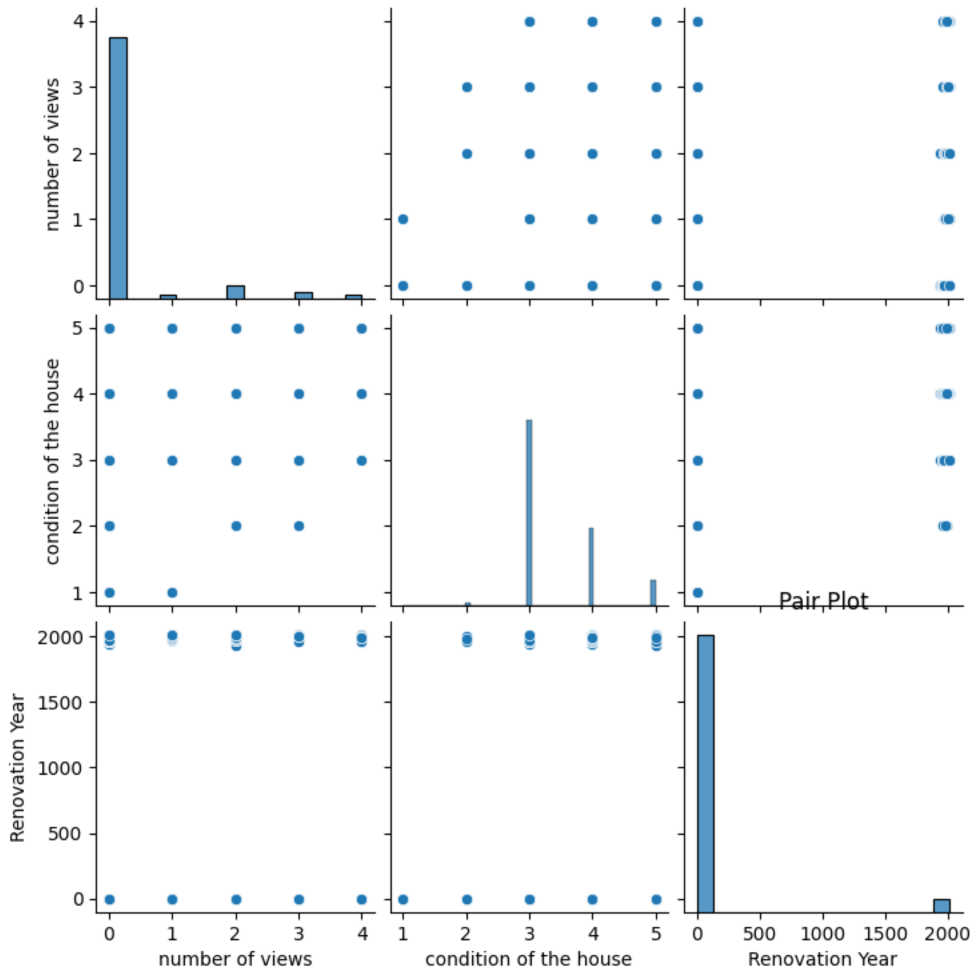
```
sns.scatterplot(x="Built Year",y="condition of the house",data=df)
plt.title("Scatter Plot")
plt.xlabel("Built Year")
plt.ylabel("condition of the house")
plt.show()
```



```
sns.jointplot(x="Price", y="number of views", data=df)
plt.title("Joint Plot")
plt.xlabel("Price")
plt.ylabel("number of views")
plt.show()
```

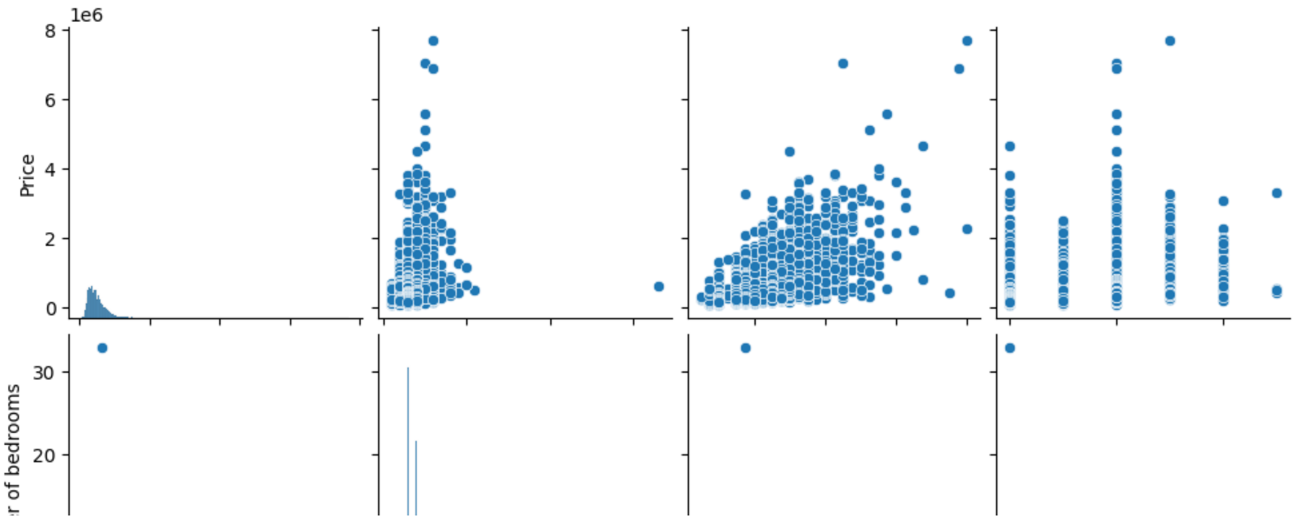


```
sns.pairplot(data=df, vars=["number of views", "condition of the house", "Renovation Year"])
plt.title("Pair Plot")
plt.show()
```

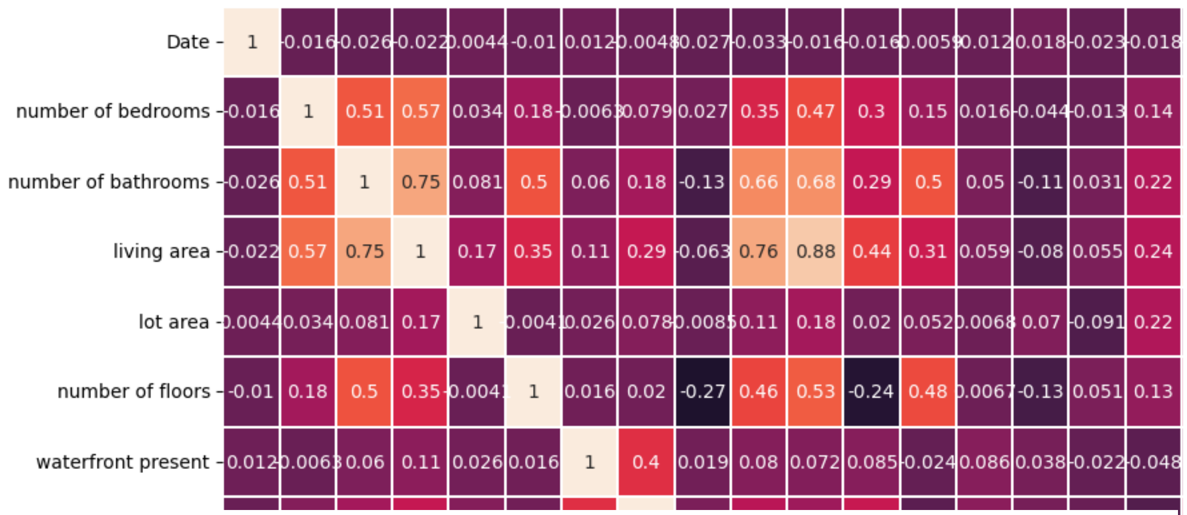


Multivariate Analysis

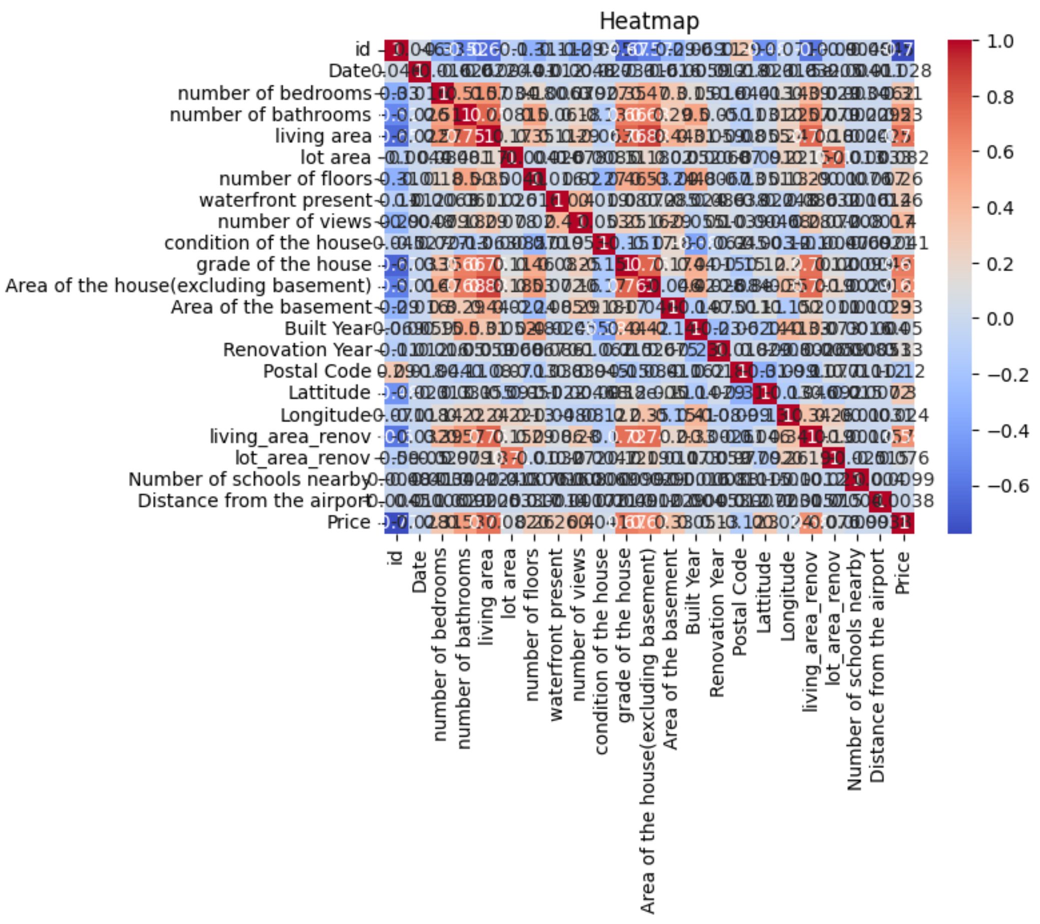
```
sns.pairplot(df[['Price', 'number of bedrooms', 'number of bathrooms', 'number of floors']])
plt.show()
```



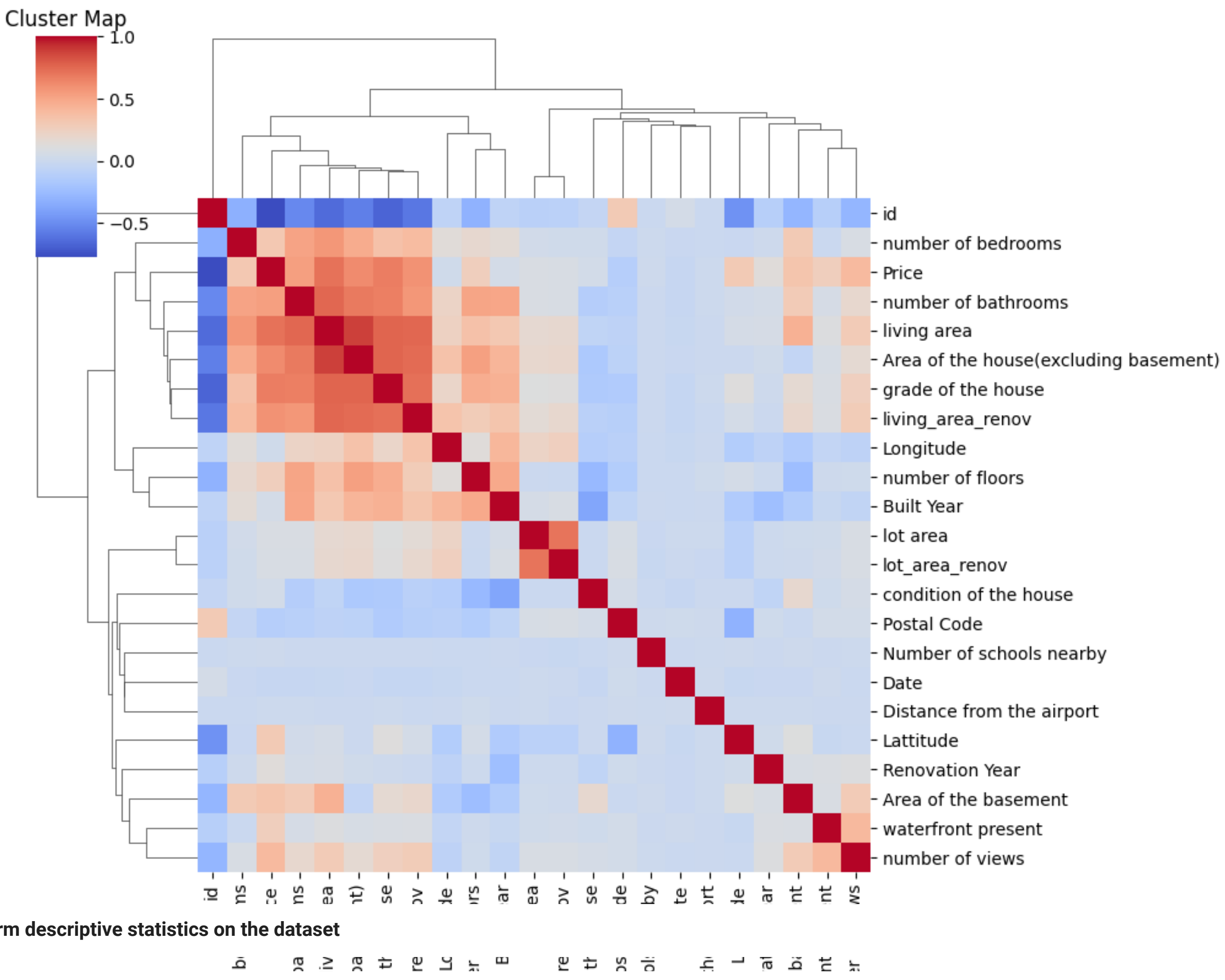
```
plt.subplots(figsize=(15, 15))
sns.heatmap(df.drop(['id'], axis=1).corr(), linewidth=0.3, annot=True)
plt.show()
```



```
sns.heatmap(df.corr(), annot=True, cmap="coolwarm")
plt.title("Heatmap")
plt.show()
```



```
sns.clustermap(df.corr(), cmap="coolwarm")
plt.title("Cluster Map")
plt.show()
```



Perform descriptive statistics on the dataset

```
print(df.describe())
```

```
                 id          Date  number of bedrooms  number of bathrooms  \
count  1.462000e+04  14620.000000        14620.000000         14620.000000   
mean   6.762821e+09  42604.538646            3.379343             2.129583   
std    6.237575e+03     67.347991            0.938719             0.769934   
min    6.762810e+09  42491.000000            1.000000             0.500000   
25%    6.762815e+09  42546.000000            3.000000             1.750000   
50%    6.762821e+09  42600.000000            3.000000             2.250000   
75%    6.762826e+09  42662.000000            4.000000             2.500000   
max    6.762832e+09  42734.000000           33.000000             8.000000   

        living area      lot area  number of floors  waterfront present  \
count  14620.000000  1.462000e+04      14620.000000        14620.000000   
mean    2098.262996  1.509328e+04          1.502360            0.007661   
std      928.275721  3.791962e+04          0.540239            0.087193   
min      370.000000  5.200000e+02          1.000000            0.000000   
25%     1440.000000  5.010750e+03          1.000000            0.000000   
50%     1930.000000  7.620000e+03          1.500000            0.000000   
75%     2570.000000  1.080000e+04          2.000000            0.000000   
max    13540.000000  1.074218e+06          3.500000            1.000000   

       number of views  condition of the house  ...    Built Year  \
count     14620.000000            14620.000000  ...  14620.000000   
mean          0.233105                3.430506  ...   1970.926402   
std           0.766259                0.664151  ...     29.493625   
min           0.000000                1.000000  ...   1900.000000   
25%           0.000000                3.000000  ...   1951.000000   
50%           0.000000                3.000000  ...   1975.000000   
75%           0.000000                4.000000  ...   1997.000000   
max           4.000000                5.000000  ...   2015.000000   

       Renovation Year    Postal Code     Lattitude     Longitude  \
count     14620.000000   14620.000000  14620.000000  14620.000000   
mean         90.924008  122033.062244     52.792848   -114.404007   
std         416.216661      19.082418      0.137522      0.141326   
min           0.000000  122003.000000     52.385900   -114.709000   
25%           0.000000  122017.000000     52.707600   -114.519000   
50%           0.000000  122032.000000     52.806400   -114.421000   
75%           0.000000  122048.000000     52.908900   -114.315000   
max        2015.000000  122072.000000     53.007600   -113.505000   

       living_area_renov  lot_area_renov  Number of schools nearby  \
count       14620.000000    14620.000000             14620.000000
mean         1996.702257    12753.500068                 2.012244
std           691.093366    26058.414467                 0.817284
min           460.000000      651.000000                 1.000000
25%          1490.000000     5097.750000                 1.000000
50%          1850.000000     7620.000000                 2.000000
75%          2380.000000    10125.000000                 3.000000
max          6110.000000   560617.000000                 3.000000

       Distance from the airport         Price
count               14620.000000  1.462000e+04
mean                   64.950958  5.389322e+05
std                     8.936008  3.675324e+05
min                    50.000000  7.800000e+04
25%                    57.000000  3.200000e+05
50%                    65.000000  4.500000e+05
75%                    73.000000  6.450000e+05
```

```
print(df.count())
```

```
id                                       14620
Date                                     14620
number of bedrooms                       14620
number of bathrooms                      14620
living area                              14620
lot area                                 14620
number of floors                         14620
waterfront present                       14620
number of views                          14620
condition of the house                   14620
grade of the house                       14620
Area of the house(excluding basement)    14620
Area of the basement                     14620
Built Year                               14620
Renovation Year                          14620
Postal Code                              14620
Lattitude                                14620
Longitude                                14620
living_area_renov                        14620
lot_area_renov                           14620
Number of schools nearby                 14620
Distance from the airport                14620
Price                                    14620
dtype: int64
```

```
print(df.corr())
```

```
                                             id      Date  number of bedrooms  \
id                                     1.000000  0.045966           -0.329034
Date                                   0.045966  1.000000           -0.015663
number of bedrooms                    -0.329034 -0.015663            1.000000
number of bathrooms                   -0.516909 -0.026485            0.509784
living area                           -0.648127 -0.021958            0.570526
lot area                              -0.100269  0.004392            0.034416
number of floors                      -0.312305 -0.010335            0.177294
waterfront present                    -0.112937  0.012006           -0.006257
number of views                       -0.293004 -0.004782            0.078665
condition of the house                -0.045061 -0.027402            0.026597
grade of the house                    -0.673448 -0.033097            0.352945
Area of the house(excluding basement) -0.565116 -0.015994            0.473599
Area of the basement                  -0.290806 -0.015711            0.300332
Built Year                            -0.068645 -0.005869            0.152954
Renovation Year                       -0.109155 -0.011636            0.016132
Postal Code                            0.294709  0.018243           -0.044156
Lattitude                             -0.479334 -0.023327           -0.013163
Longitude                             -0.070841 -0.018231            0.135712
living_area_renov                     -0.599900 -0.032495            0.389855
lot_area_renov                        -0.089604 -0.000050            0.029400
Number of schools nearby              -0.004821 -0.004071            0.003397
Distance from the airport             -0.004542  0.011457           -0.006157
Price                                 -0.773114 -0.027919            0.308460

                                       number of bathrooms  living area  \
id                                               -0.516909    -0.648127
Date                                             -0.026485    -0.021958
number of bedrooms                                0.509784     0.570526
number of bathrooms                               1.000000     0.753517
living area                                       0.753517     1.000000
lot area                                          0.080806     0.174420
number of floors                                  0.502924     0.354743
waterfront present                                0.060104     0.105837
number of views                                   0.183789     0.287728
condition of the house                           -0.128232    -0.063358
grade of the house                                0.663054     0.761835
Area of the house(excluding basement)             0.684391     0.875793
Area of the basement                              0.287190     0.441491
Built Year                                        0.498127     0.309602
Renovation Year                                   0.049669     0.059400
Postal Code                                      -0.105546    -0.080303
```

```
Lattitude                                      0.031156     0.054518
Longitude                                      0.223904     0.240208
living_area_renov                              0.570530     0.757571
lot_area_renov                                 0.078627     0.180312
Number of schools nearby                       0.002180     0.002370
Distance from the airport                      0.009206     0.002511
Price                                          0.531735     0.712169

                                       lot area  number of floors  \
id                                    -0.100269         -0.312305
Date                                   0.004392         -0.010335
number of bedrooms                     0.034416          0.177294
number of bathrooms                    0.080806          0.502924
living area                            0.174420          0.354743
lot area                               1.000000         -0.004138
number of floors                      -0.004138          1.000000
```

```
print(df['Number of schools nearby'].value_counts())
```

```
3    4973
2    4853
1    4794
Name: Number of schools nearby, dtype: int64
```

```
print('Mean:', df['Distance from the airport'].mean())
print('Median:', df['Area of the basement'].median())
print('Mode:', df['grade of the house'].mode())
```

```
Mean: 64.95095759233926
Median: 0.0
Mode: 0    7
Name: grade of the house, dtype: int64
```

```
df.duplicated().sum()
```

```
0
```

Handle the Missing values

```
print(df.isnull().sum())
```

```
id                                      0
Date                                    0
number of bedrooms                      0
number of bathrooms                     0
living area                             0
lot area                                0
number of floors                        0
waterfront present                      0
number of views                         0
condition of the house                  0
grade of the house                      0
Area of the house(excluding basement)   0
Area of the basement                    0
Built Year                              0
Renovation Year                         0
Postal Code                             0
Lattitude                               0
Longitude                               0
living_area_renov                       0
lot_area_renov                          0
Number of schools nearby                0
Distance from the airport               0
Price                                   0
dtype: int64
```

```
df.dropna(inplace=True)
```

```
df.fillna(0, inplace=True)
```

```
df.interpolate(inplace=True)
```

```
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import MinMaxScaler

x=df.drop(['Price','Date'],axis=1)
x.set_index(['id'],inplace=True)
y=df[['id','Price']]
```

```
x.head()
```

id	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house
6762810145	5	2.50	3650	9050	2.0	0	4	5
6762810635	4	2.50	2920	4000	1.5	0	0	5
6762810998	5	2.75	2910	9480	1.5	0	0	3
6762812605	4	2.50	3310	42998	2.0	0	0	3
6762812919	3	2.00	2710	4500	1.5	0	0	4

```
sc=StandardScaler()
sc=MinMaxScaler()
x=pd.DataFrame(sc.fit_transform(x),columns=x.columns.values)
x.head()
```

	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	g o h
0	0.12500	0.266667	0.249051	0.007945	0.4	0.0	1.0	1.00	0.6
1	0.09375	0.266667	0.193622	0.003241	0.2	0.0	0.0	1.00	0.4
2	0.12500	0.300000	0.192863	0.008345	0.2	0.0	0.0	0.50	0.4
3	0.09375	0.266667	0.223235	0.039562	0.4	0.0	0.0	0.50	0.5
4	0.06250	0.200000	0.177677	0.003707	0.2	0.0	0.0	0.75	0.4

```
y.head()
```

	id	Price
0	6762810145	2380000
1	6762810635	1400000
2	6762810998	1200000
3	6762812605	838000
4	6762812919	805000

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.metrics import r2_score

x_train,x_test,y_train,y_test = train_test_split(x , y['Price'],test_size =0.1,random_state=2)
model = GradientBoostingRegressor(n_estimators= 400,max_depth=5,min_samples_split=2,learning_rate=0.1)
model.fit(x_train,y_train)

y_pred = model.predict(x_test)
model.score(x_test,y_test)
```

```
    0.91192835426033
```

```
r2_score(y_pred,y_test)
```

```
    0.9013070601704208
```

```
y_pred
```

```
    array([497766.12740438, 244495.3776842 , 293819.40063242, ...,
           698495.60350629, 297006.00386358, 245881.76921871])
```

```
y_pred_list = y['id'][-len(y_pred):].tolist()

y_pred_df=pd.DataFrame(y_pred_list,columns=['ID'])
y_pred_df['Predicted Price'] = y_pred.round(2)
```

```
y_pred_df
```

```
              ID  Predicted Price
   0  6762811233        497766.13
   1  6762811403        244495.38
   2  6762811775        293819.40
   3  6762811861        397555.35
   4  6762812009        474843.29
 ...         ...              ...
1457  6762830250       1041014.57
1458  6762830339        317512.59
1459  6762830618        698495.60
1460  6762830709        297006.00
1461  6762831463        245881.77

1462 rows × 2 columns
```